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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/388,063	08/30/1999	VISHNU AGARWAL	MI22-1196	3351

21567 7590 08/09/2002

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EXAMINER

FENTY, JESSE A

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 08/09/2002

21

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/388,063

Applicant(s)

AGARWAL ET AL.

Examiner

Jesse A. Fenty

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM  
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 February 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 5-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 20.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

### DETAILED ACTION

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 5-9, 11-15, 17-22 and 25-29 are rejected under 35 U.S.C. 102(e) as being anticipated by Watanabe et al. (U.S. Patent No. 6,153,898).

In re claims 5 and 12, Watanabe (Fig. 1) discloses a capacitor comprising first and second conductive electrodes (14, 16) having a high k capacitor dielectric region (15) positioned therebetween, the high k capacitor dielectric region comprising a layer of metal oxide having multiple different metals bonded with oxygen (column 4, lines 10-17, 24-26), one of the metals when bonded with oxygen having a first current leakage potential, another of the metals when bonded with oxygen having a second current leakage potential which is greater than the first current leakage potential, the layer comprising at least one portion having greater concentration of the one metal bonded with oxygen which is more proximate at least one of the first and second electrodes (column 4, lines 37-39) than another portion more proximate a center of the layer.

In re claim 6, as best understood, Watanabe discloses the device of claim 5, wherein the another portion has a greater concentration of the another of the metals bonded with oxygen than the one portion.

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In re claim 7, Watanabe discloses the device of claim 5, wherein the layer comprises portions having a greater concentration of the one metal bonded with oxygen more proximate both the first and second electrodes than the another portion more proximate the center of the layer.

In re claim 8, Watanabe discloses the device of claim 5, wherein the at least one portion contacts the one electrode.

In re claims 9, 15 and 21, Watanabe discloses the devices of claims 5, 12 and 18 respectively, wherein the layer comprises portions having a greater concentration of the one metal bonded with oxygen more proximate both the first and second electrodes than the another portion more proximate the center of the layer, said greater concentration portions respectively contacting the first and second electrodes.

In re claim 11, Watanabe discloses the device of claim 5, wherein the capacitor dielectric region consists essentially of the layer.

In re claim 13, Watanabe discloses the device of claim 12, wherein the layer comprises portions having a greater concentration of the first material more proximate both the first and second electrodes than the another portion more proximate a center of the layer.

In re claim 14, Watanabe discloses the device of claim 12, wherein the at least one portion contacts the one electrode.

In re claim 17, Watanabe discloses the device of claim 12, wherein the capacitor dielectric region consists essentially of the layer.

In re claims 18 and 25, Watanabe (Fig. 1) discloses a capacitor comprising first (14) and second (16) conductive electrodes having a high k capacitor dielectric region (15) positioned

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therebetween, the high k capacitor dielectric region comprising layer of metal oxide having multiple different metals bonded with oxygen (column 4, lines 10-17, 24-26), one of the metals when bonded with oxygen having a first dielectric constant, another of the metals when bonded with oxygen having a second dielectric constant which is less than the first dielectric constant, the layer comprising at least one portion having a greater concentration of the one metal bonded with oxygen more proximate a center of the layer than another portion more proximate either of the first and second electrodes.

In re claim 19, Watanabe discloses the device of claim 18, wherein the another portion has a greater concentration of the another of the metals bonded with oxygen than the one portion.

In re claim 20, Watanabe discloses the device of claim 18, wherein the another portion has a greater concentration of the another of the metals bonded with oxygen than the one portion.

In re claim 22, Watanabe discloses the device of claim 18, wherein the capacitor dielectric region consists essentially of the layer.

In re claim 26, Watanabe discloses the device of claim 25, wherein the layer comprises portions having a greater concentration of the first material more proximate both the first and second electrodes than the another portion more proximate a center of the layer.

In re claim 27, Watanabe discloses the device of claim 25, wherein the another portion contacts the one electrode.

In re claims 28, Watanabe discloses the devices of claims 25, wherein the layer comprises portions having a greater concentration of the one metal bonded with oxygen more proximate both the first and second electrodes than the another portion more proximate the center of the layer, said greater concentration portions respectively contacting the first and second electrodes.

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In re claim 29, Watanabe discloses the device of claim 25, wherein the capacitor dielectric region consists essentially of the layer.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 10, 16, 23, 24, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (as above).

In re claims 10, 16, 23, 24, 30 and 31, Watanabe discloses the devices of claims 5, 12, 18 and 25 respectively, wherein the metals bonded with oxygen may be strontium, bismuth, tantalum, niobium, barium or calcium but does not expressly disclose a titanate or titanium. Titanium and its derivative titanate are refractory metals similar to the metals suggested by Watanabe used in ferroelectric devices and it would have been obvious to for one skilled in the art to substitute a similar metal for another in the course of routine experimentation.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe (as above) in view of Ochiai (U.S. Patent No. 6,043,526).

In re claim 32, Watanabe (Fig. 1) discloses a capacitor comprising first and second conductive electrodes having a high k charge storage dielectric region positioned therebetween, the high k charge storage dielectric region comprising a layer of metal oxide having multiple

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different metals bonded with oxygen, the layer having varying stoichiometry across its thickness, the layer comprising an inner region, a middle region, and an outer region, the middle region having a different stoichiometry than both the inner and outer regions.

Watanabe does not expressly disclose the upper and lower electrodes comprising titanium nitride. Ochiai discloses the use of titanium nitride as a bottom electrode in ferroelectric devices. It would have been obvious for one skilled in the art at the time of the invention to use such a layer as disclosed by Ochai for the purpose, for example, of decreasing the contact resistance (Ochai; column 7, lines 38-41).

### ***Response to Arguments***

1. Applicant's arguments filed 02/27/02 have been fully considered but they are not persuasive
2. Examiner appreciates the explanations given by attorney for applicant to alleviate the confusion cited in the previous Office Action.
3. Regarding the 35 USC 102 rejections, applicant argues that the art rejection does not specifically teach two layers with different leakage potentials. In the body of the rejection, Examiner cited certain columns and lines for reference. However, these exemplary texts were not to be relied on at the expense of other teachings in the relied upon reference. The entire Watanabe reference is relied upon in the rejection. Watanabe (columns 4 and 5) teaches a multi-layer metal oxide made up bismuth, a first element, a second element and oxygen, wherein the concentration of the first element (Sr, Ca or Ba) can be varied from the top to the bottom of the

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layer and at the center. Column 4 of Watanabe also discloses that the concentrations other metals of the metal oxide may be varied.

Though not explicitly stated in the reference the metal oxide layers with different concentrations of the first element will therefore inherently have different current leakage potentials and different dielectric constants.

### *Conclusion*

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jesse A. Fenty whose telephone number is 703-308-8137. The examiner can normally be reached on 5/4-9 1st Fri. Off.




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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 703-308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-746-3892 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Jesse A. Fenty  
Examiner  
Art Unit 2815

  
JAF  
August 7, 2002



ALLAN R. WILSON  
PRIMARY EXAMINER